LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – **MATHEMATICS**

THIRD SEMESTER – NOVEMBER 2015

MT 3965 - NUMERICAL ANALYSIS

Date : 11/11/2015 Dept. No. Max. : 100 Marks

Time : 09:00-12:00

ANSWER ALL THE QUESTIONS: **(5 X 20 = 100)**

1. (a) Explain Regula Falsi Method.

(OR)

(b) Derive Newton Raphson Iteration formula. **(5)**

(c) Find a root of $3x + \sin x - e^x = 0$ by Bisection method.

(OR)

(d) Find a positive root of $x^3 - 5x + 3 = 0$ by Newton Raphson method. **(15)**

2. (a) Derive stirling's formula.

(OR)

(b) Derive Laplace Everett's formula. **(5)**

(c) (i) State and prove Newton's forward formula for interpolation.

(ii) Find the value of f(x) when x = 32 given the following table

x	30	35	40	45	50
f(x)	15.9	14.9	14.1	13.3	12.5

(OR)

(d) (i) State and prove Newton's backward formula for interpolation.

(ii) A function y is given by the following table

x	0	1	2	3	4
y	79	91	105	116	127

Estimate the value of y when x = 3.5by Newton's Backward formula. **(7 + 8)**

3. (a) Find $y'(x)$ from the table given below and hence find $y'(0)$ and $y''(0)$.

x	0	1	2	3	4
y	4	8	15	7	6

(OR)

(b) Given the following table

x	1.96	1.98	2	2.02	2.04
y	0.7825	0.7739	0.7651	0.7563	0.7473

Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at x = 2.03. **(5)**

(c) Find the maximum and minimum values of "y" from the following table

x	- 2	- 1	0	1	2	3	4
y	2	- 0.25	0	- 0.25	2	15.75	56

(OR)

(d) Evaluate $\int_0^{.6} \frac{1}{1+x} dx$ by (i) direct integration (ii) Trapezoidal Rule (iii) Simpson's 1/3 Rule (iv) Simpson's 3/8 Rule. **(15)**

4. (a) Explain Gauss Jacobi method.

(OR)

(b) Explain Gauss Seidel method. **(5)**

(c) Solve the linear system by Gauss-Jordan method.

$5x_1 + x_2 + x_3 + x_4 = 4$
$x_1 + 7x_2 + x_3 + x_4 = 12$
$x_1 + x_2 + 6x_3 + x_4 = -5$
$x_1 + x_2 + x_3 + 4x_4 = -6$

(OR)

(d) Solve the following equations by Gauss Seidel method
$27x + 6y - z = 85$; $x + y + 54z = 110$; $6x + 15y + 2z = 72$. **(15)**

5. (a) Using Euler's method, find y for x = 0.1 given $\frac{dy}{dx} = \frac{y-x}{y+x}; y(0) = 1$

(OR)

(b) Explain Picard's method of successive approximation. **(5)**

(c) Using Runge-Kutta Method of fourth order solve $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$ with y(0) = 1 at x = 0.2, 0.4.

(OR)

(d) Given $\frac{dy}{dx} = x + y, y(0) = 1$. Find the value of y when x = 0.1, 0.2 by Picard's method. Check the result with exact value. **(15)**

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